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(56) Documents Cited  
**GB 2287377 A GB 2276062 A GB 2273419 A**  
**US 5040209 A**

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## (54) Telephone network

(57) In a shared line network provided with call waiting services, the tone generated for indicating a call waiting are chosen to have the same respective cadence as the ringing cadence of each number. This enables the user to recognise for whom, or for which number, the new incoming call is waiting.

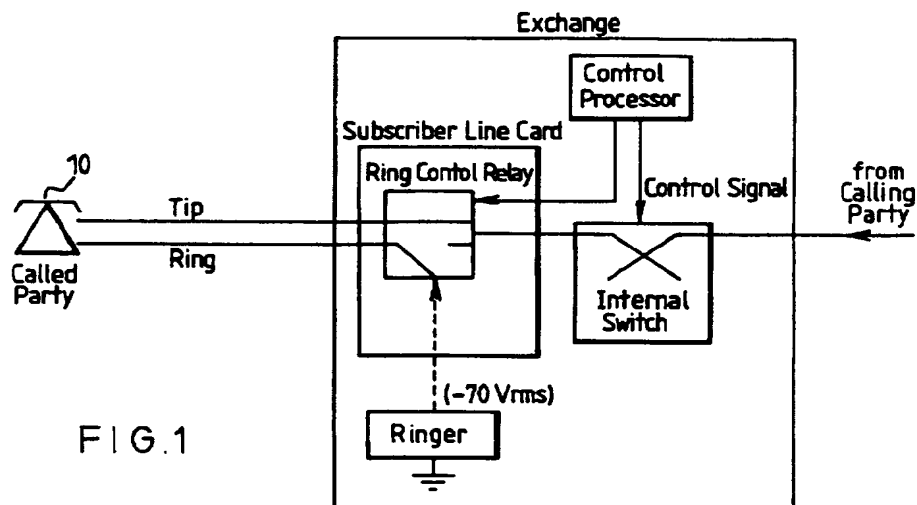
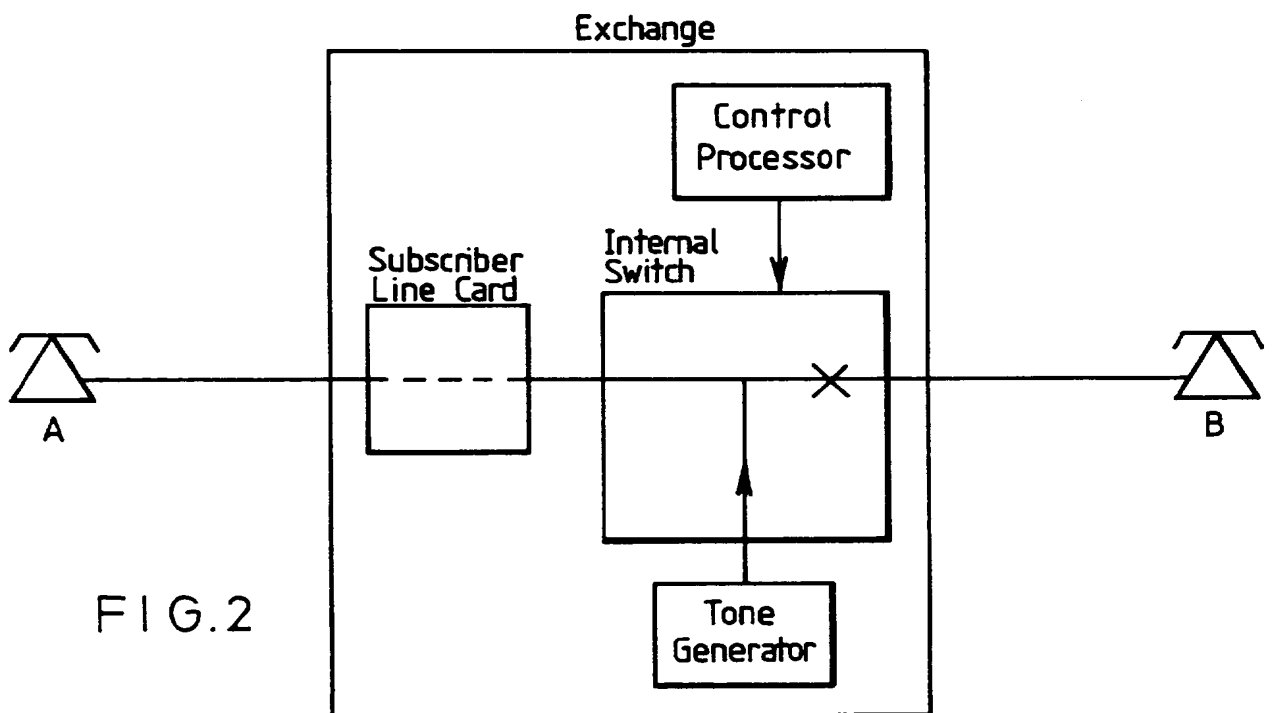
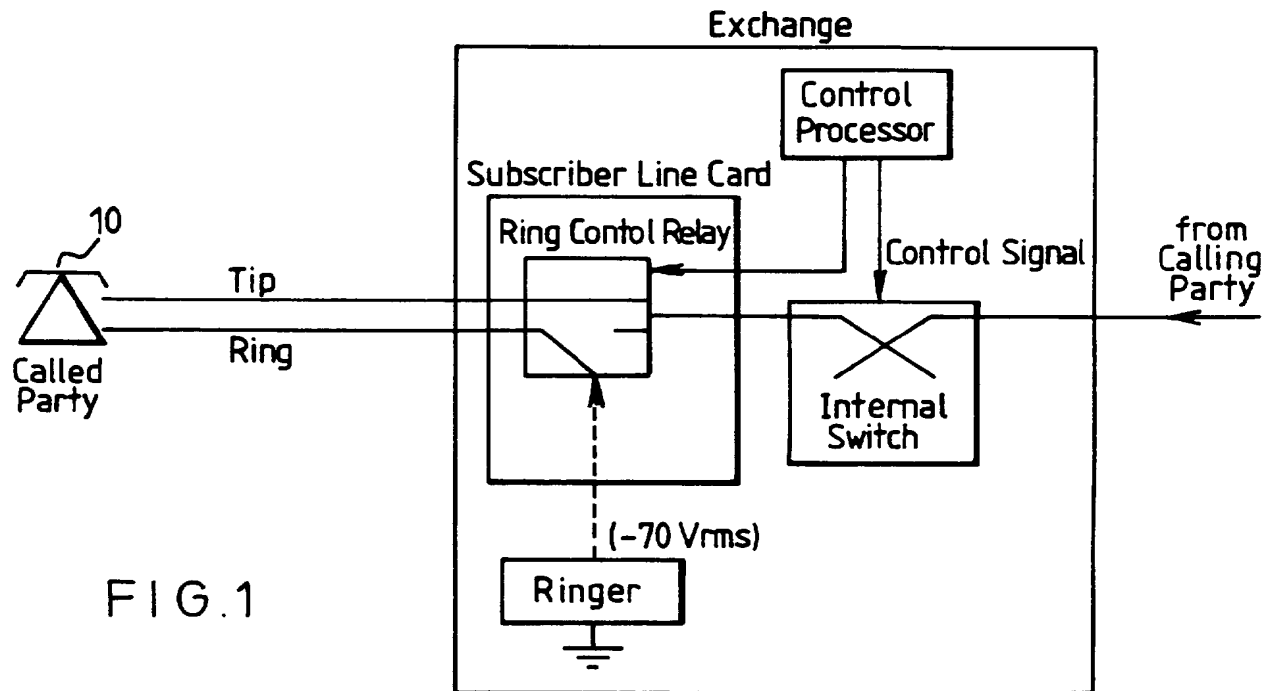


FIG. 1



The invention relates to telephone networks.

The invention relates more particularly to duplex telephone networks when two telephones are connected to a single line. Each telephone has its own number and is provided with a respective ringing cadence so that incoming calls can be identified. The calls will be typically identified or differentiated as incoming calls for parents or children of the household, or English or Chinese language, or ordinary call or calls diverted from another number, for example, an office number, and so on. The ringing cadence, that is the pattern of rings, can be made readily distinguishable by long and short rings and combinations thereof.

It is already known to provide call waiting service where signals are provided on the line whenever other incoming calls occur during a conversation. The call waiting tones are heard only by the called number and advises the called number to terminate a conversation if appropriate, so as to be able to take another call that is waiting. On duplex lines at present, the call waiting signals do not indicate who the waiting call is for, that is, which of the duplex line numbers the waiting call is calling.

It is an object of the invention to overcome this problem.

According to the invention there is provided a multiplex telephone line network in which a number of telephone numbers are provided for use on a single line and in which each number is associated with an individual ringing cadence so that the receiver can identify which of the numbers has been called, and including means for generating call waiting tones having different cadences that can be recognised by the receiver.

The cadence of the call waiting tones are preferably at least of the same general pattern as the ringing cadences of respective telephone numbers.

A duplex telephone line network according to the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a schematic diagram of the network; and

Figure 2 is a schematic diagram showing a component of a call waiting service.

Referring to the drawings, in Figure 1 a telephone 10 is connected to an exchange by a conventional twin core cable. A subscriber line card at the exchange incorporates a ring control relay that controls a ringer to produce normal ringing at the telephone 10. Because this is a duplex line, a different ringing cadence is

produced according to which of the two numbers is called. The ring control relay is arranged to provide two ringing cadences, that are normally quite different so that the telephone user has no difficulty in distinguishing the one  
5 cadence from the other. For example, one cadence could be a series of "long" signals, typical of a United States ringing tones heard by the caller, and the other cadence could be two "short" rings separated by a longer pause, typical of United Kingdom ringing tones. Thus, the user  
10 can identify which number is being called.

During a call when the user A, say, and the caller B are connected and in conversation, other callers C may wish to speak to one of the parties A or B. When other callers dial one of the numbers of the conversing parties, they  
15 would normally hear an engaged tone and be unable to make a connection for the time being. In the described arrangement, where there is a call waiting service exchange in Figure 2 provides tones which are transmitted to the called number A, say, during the conversation. The  
20 tones are transmitted via the twin core cable to the telephone during one or more brief intervals when B is disconnected. This means that B does not hear the call waiting tones. The user A hears signals on the telephone that indicate that an incoming call is waiting for him.  
25 He must decide shortly whether to terminate his conversation with B and take the new incoming call or ignore the call. Normally, in the latter case, the other

caller C will find in due course that the apparent ringing at telephone A has ceased. As A is using a shared (duplex) line it is not possible for him to identify whether the other caller C has called his number or the shared number. However, and in accordance with embodiments of the invention the call waiting service is arranged to mimic the normal ringing cadence of each telephone number. Thus, the call waiting service supplied on this line, could be either long tones or pairs of short tones with a longish separation, for example. If the call waiting service tones does not "correspond" to a particular ringing cadence, A knows that the new incoming call is not for him anyway, and normally he can ignore such calls. In this way duplex, or multiplex, use of lines can make use of otherwise normal call waiting services and the users are enabled to identify or differentiate for which number of the line the call waiting tone has been provided. Thus, user A can therefore more informedly decide, whether to take a new incoming waiting call or ignore it.

It is preferable, although not necessary, that the call service tones are generated in the same or a similar cadence to the ringing cadence of each number. This will be more familiar to the users and particularly helpful for multiplex lines when several ringing cadences are used.

CLAIMS

1. A multiplex telephone line network in which a number of telephone numbers are provided for use on a single line and in which each number is associated with an individual ringing cadence so that the receiver can identify which of the numbers has been called, and including means for generating call waiting tones having different cadences that can be recognised by the receiver.  
5
2. A network according to claim 1, in which the cadence of the call waiting tones are at least of the same general pattern as the ringing cadences of respective telephone numbers.  
10
3. A duplex telephone line network substantially as herein described with reference to the accompanying drawings.  
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**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): H4K: KBHC; KBT; KF42; KF424; KQA

Int Cl (Ed.6): H04M

Other: ONLINE: WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2 287 377 A (MITEL)	
A	GB 2 276 062 A (MITEL)	
A	GB 2 273 419 A (MITEL)	
A	US 5 040 209 (GREENBERG...)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.